Specification

G065VN01 V2 incl. Touch - 4W

Content:

Mechanical Drawing

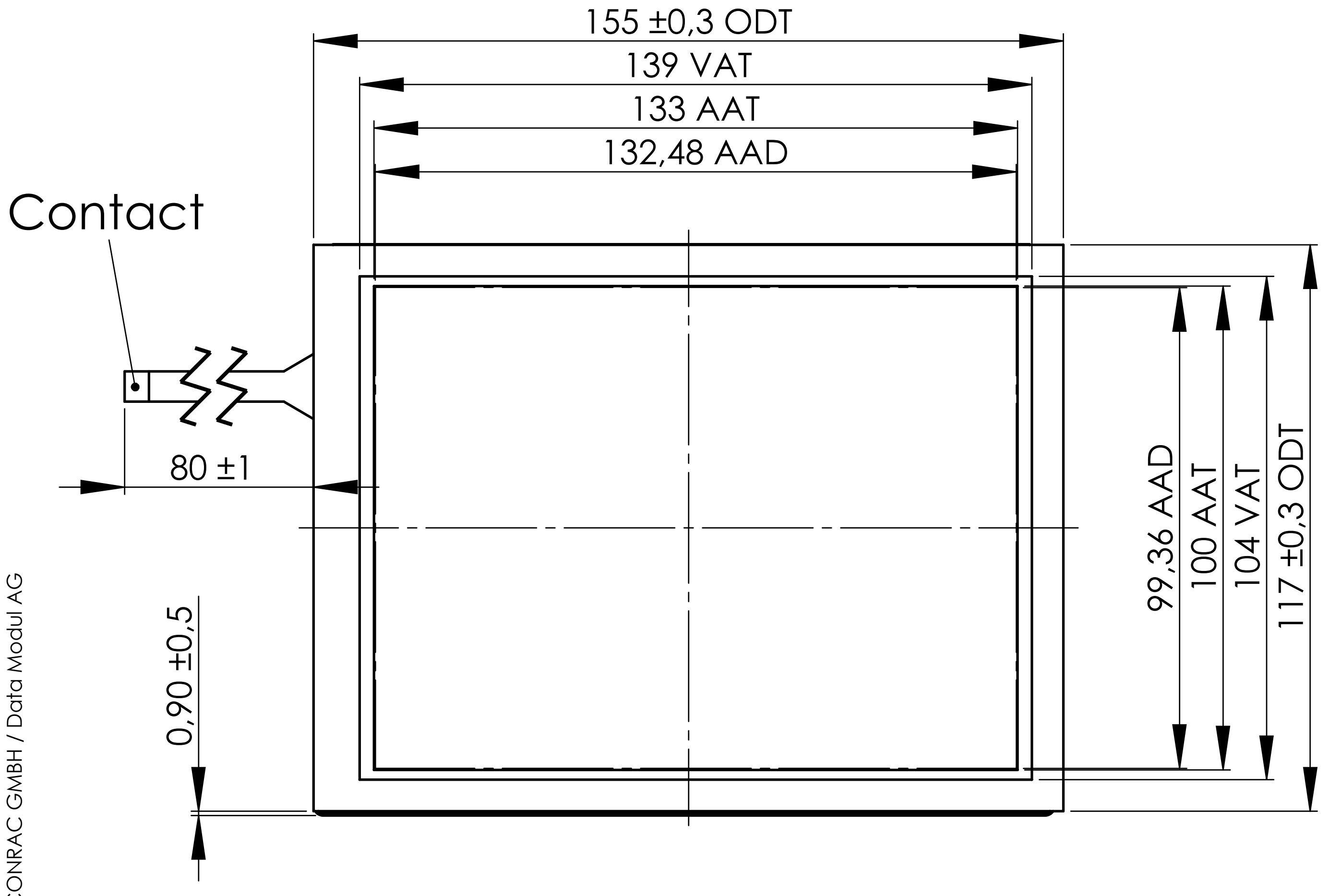
Appendix A: Specification of TFT G065VN01 V2

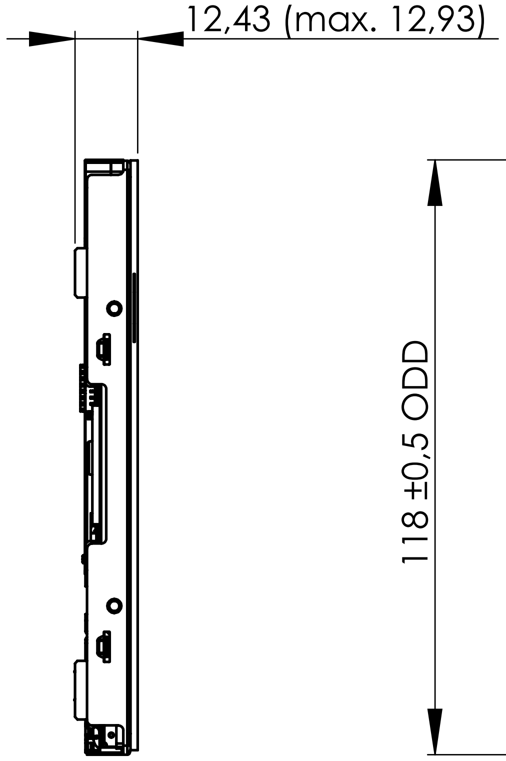
Appendix B: Specification of Touch AST-065B080A

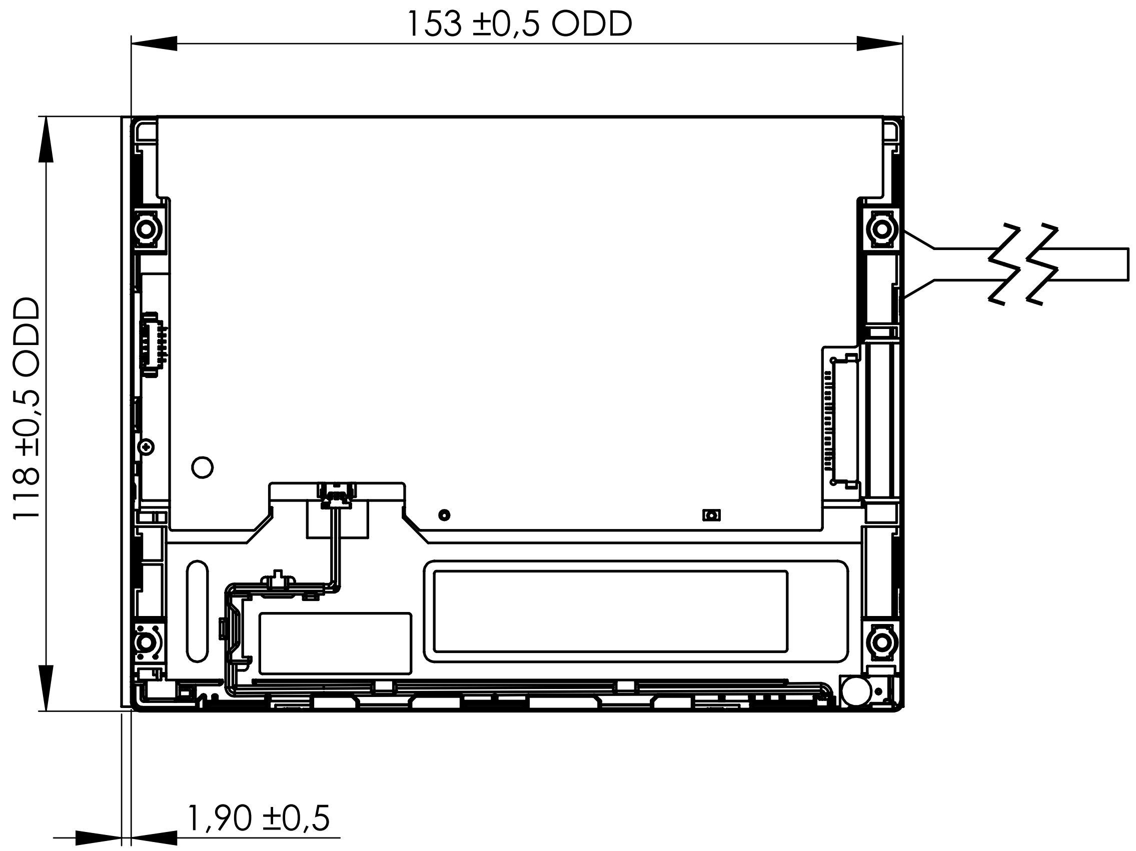
Please be aware that some of the values e.g. optical, mechanical etc. of the complete unit (assembled display plus touch panel) might differ from the original values of the individual components.

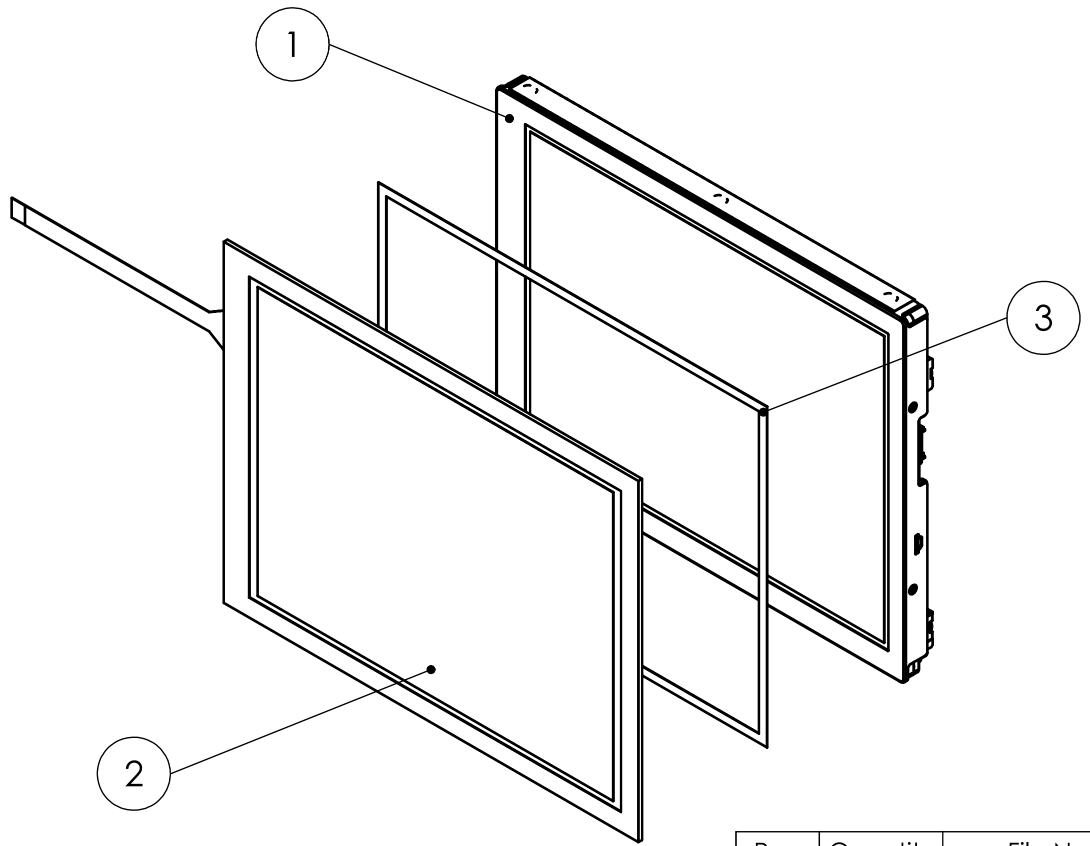
Version: March 2013

Note: This specification is subject to change without prior notice









M 1:2

Pos.	Quantity	File Number	Description
1	1	1009880-T	TFT-LCD MODULE 6,5"
2	1	1009864-T	Touch
3	1	1009940-T	Klebeband 3x0,13

ODD	Outline Dimension Display
ODT	Outline Dimension Touch
VAT	Viewing Area Touch
AAT	Active Area Touch
AAD	Active Area Display

This drawing is only schematic representation of the structure.
The parts to be used are defined in the ProAlpha parts list.

REV.	NO. OF CHANGES	REL.DATE	DRAWN BY	E.C.-NO.	MODIFICATION/DESCRIPTION
000		26.02.2013	Aschenbrenner	10000	Neuanlage

FINISH

CONRAC D-97990 Weikersheim

DATA MODUL D-80687 München

RELEASED: ja

PROJECT: DMO_C_

MATERIAL

DRAWING TITLE

Assembly

TFT Display 6,5" + resistive Touch

TOLERANCES DIN ISO 2768-mK

SURFACES DIN ISO 1302

DRAWING/PART NUMBER 12002651 000

FILE NUMBER: 1009941

SCALE 2:3

SIZE ISO A3

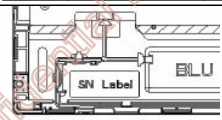
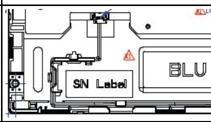
☐ **Preliminary Specification**
■ **Final Specification**

Module	**6.5 Inch Color TFT-LCD**
Model Name	**G065VN01 V2**

Customer	**Date**	**Approved by**	**Date**
		Leader Feng	2012/5/21
Checked & Approved by		**Prepared by**	
		Yichih Chen	2012/5/21
Note: This Specification is subject to change without notice.		General Display Business Division / AU Optronics corporation	

Contents

Record of Revision

<table>
<tr><th>Version and Date</th><th>Page</th><th>Old description</th><th>New Description</th><th>Remark</th></tr>
<tr><td>0.1, Apr. 23, 2009</td><td>All</td><td>First edition preliminary specifications</td><td></td><td></td></tr>
<tr><td rowspan="9">1.0, Oct. 22, 2009</td><td>5</td><td>Temperature Range
Operating: -30 to +85
Storage (Non-Operating): -30 to +85</td><td>Temperature Range
Operating: -30 to +80*
Storage (Non-Operating): -30 to +80*
*:Panel surface temperature</td><td>Section 2.1</td></tr>
<tr><td>6</td><td>White Luminance:
Min: 500, Typ: 700</td><td>White Luminance:
Min: 600, Typ: 800</td><td>Section 2.2</td></tr>
<tr><td>6</td><td>Color / Chromaticity Coordinates
Red x, Red y: TBD
Green x, Green y: TBD
Blue x, Blue y: TBD</td><td>Color / Chromaticity Coordinates<table>
<tr><th>Conditions</th><th>Min.</th><th>Typ.</th><th>Max.</th></tr>
<tr><td>White x</td><td>0.263</td><td>0.313</td><td>0.363</td></tr>
<tr><td>White y</td><td>0.279</td><td>0.329</td><td>0.379</td></tr>
<tr><td>Red x</td><td>0.559</td><td>0.609</td><td>0.659</td></tr>
<tr><td>Red y</td><td>0.314</td><td>0.364</td><td>0.414</td></tr>
<tr><td>Green x</td><td>0.285</td><td>0.335</td><td>0.385</td></tr>
<tr><td>Green y</td><td>0.554</td><td>0.604</td><td>0.654</td></tr>
<tr><td>Blue x</td><td>0.099</td><td>0.149</td><td>0.159</td></tr>
<tr><td>Blue y</td><td>0.055</td><td>0.105</td><td>0.155</td></tr>
</table></td><td>Section 2.2</td></tr>
<tr><td>6</td><td>Color Gamut
Min: TBD</td><td>Color Gamut
Min: 50%</td><td>Section 2.2</td></tr>
<tr><td>9</td><td>Absolute Ratings of Environment
Operating Temperature, Max: +85
Storage Temperature, Max: +85</td><td>Absolute Ratings of Environment
Operating Temperature, Max: +80*
Storage Temperature, Max: +80*
*: Panel surface temperature</td><td>Section 4.2</td></tr>
<tr><td>12</td><td>IrushLED
Typ/Max: TBD</td><td>IrushLED
Typ: 0.37 A, Max: 0.41 A</td><td>Section 5.2.1</td></tr>
<tr><td>12</td><td>Operating Life
Min: 25000, Max: 50000</td><td>Operating Life
Min: 50000</td><td>Section 5.2.1</td></tr>
<tr><td>17</td><td>LED Backlight Unit Interface Signal Description
Pin 5 LED On/Off: 3.3V-On; 0V-Off</td><td>LED Backlight Unit Interface Signal Description
Pin 5 LED On/Off: 3.3V-On; 0V/NC-Off</td><td>Section 6.6</td></tr>
<tr><td>21</td><td>Reliability Test Criteria
High Temperature Operation:
85□, 300Hr
High Temperature Storage:
85□, 300Hr
Thermal Shock Test:
-20□/30 min, 60□/30 min ,100cycles
Hot Start Test:
85℃/1 Hr (min.), power on/off per 5 minutes, repeat 5 times</td><td>Reliability Test Criteria
High Temperature Operation:
80□*, 300Hr
High Temperature Storage:
80□*, 300Hr
Thermal Shock Test:
-30□/30 min, 80□/30 min ,100cycles
Hot Start Test:
80℃*/1 Hr (min.), power on/off per 5 minutes, repeat 5 times
*: Panel surface temperature</td><td>Section 8</td></tr>
<tr><td>1.1, Mar. 22, 2012</td><td>12</td><td>$V_{LED\ On/Off}$ and V_{PWM} range<table>
<tr><td>$V_{LED\ On/Off}$</td><td>On Control Voltage</td><td></td><td>3.3</td><td></td><td>Volt</td><td></td></tr>
<tr><td></td><td>Off Control Voltage</td><td></td><td>0</td><td></td><td>Volt</td><td></td></tr>
<tr><td>V_{PWM}</td><td>Dimming control Voltage High</td><td>3.0</td><td>3.3</td><td>5.5</td><td>Volt</td><td></td></tr>
<tr><td></td><td>Dimming control Voltage Low</td><td>0</td><td></td><td>0.1</td><td>Volt</td><td></td></tr>
</table></td><td>$V_{LED\ On/Off}$ and V_{PWM} range<table>
<tr><td>$V_{LED\ On/Off}$</td><td>On Control Voltage</td><td>3.0</td><td>3.3</td><td>5.0</td><td>Volt</td><td></td></tr>
<tr><td></td><td>Off Control Voltage</td><td>0</td><td></td><td>0.15</td><td>Volt</td><td></td></tr>
<tr><td>V_{PWM}</td><td>Dimming control Voltage High</td><td>3.0</td><td>3.3</td><td>5.0</td><td>Volt</td><td></td></tr>
<tr><td></td><td>Dimming control Voltage Low</td><td>0</td><td></td><td>0.1</td><td>Volt</td><td></td></tr>
</table></td><td>Section 5.2.1</td></tr>
<tr><td>1.2, May 21, 2012</td><td>20</td><td>
</td><td>
</td><td>Section 7.3</td></tr>
<tr><td rowspan="2">1.3, July 03, 2012</td><td>9</td><td>LED BLU Drive Absolute Ratings Voltage range<table>
<tr><td>LED BLU Drive Voltage</td><td>V_{LED}</td><td>0</td><td>25</td><td>Volt</td><td>Ta= 25°C</td></tr>
</table></td><td>LED BLU Drive Absolute Ratings Voltage range<table>
<tr><td>LED BLU Drive Voltage</td><td>V_{LED}</td><td>0</td><td>16</td><td>Volt</td><td>Ta= 25°C</td></tr>
</table></td><td>Section 4.1</td></tr>
<tr><td>12</td><td>V_{LED} input voltage range<table>
<tr><th>Symbol</th><th>Parameter</th><th>Min</th><th>Typ</th><th>Max</th><th>Units</th><th>Remark</th></tr>
<tr><td>V_{LED}</td><td>Input Voltage</td><td>9</td><td>12</td><td>20</td><td>Volt</td><td></td></tr>
</table></td><td>V_{LED} input voltage range<table>
<tr><th>Symbol</th><th>Parameter</th><th>Min</th><th>Typ</th><th>Max</th><th>Units</th><th>Remark</th></tr>
<tr><td>V_{LED}</td><td>Input Voltage</td><td>9</td><td>12</td><td>13</td><td>Volt</td><td></td></tr>
</table></td><td>Section 5.2.1</td></tr>
</table>

1. Operating Precautions

1) Display area (Polarizer) of TFT-LCD Module is easily to be damaged, please be cautious and not to scratch it.
2) Be sure to power off your machine before connecting or disconnecting your signal cable to TFT-LCD Module.
3) Wipe off water drop on display area immediately. Long contact with water may cause discoloration or spots.
4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.
5) Display area (Glass) of TFT-LCD Module may be broken or cracked if bump Module against hard object.
6) To avoid ESD (Electro Static Discharde) damage, be sure to ground yourself before handling TFT-LCD Module.
7) Do not open nor modify the TFT-LCD module assembly.
8) Do not press the reflector sheet at the back of the module to any direction.
9) In case if TFT-LCD module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED Reflector edge. Instead, press at the far ends of the LED Reflector edge softly. Otherwise the TFT-LCD Module may be damaged.
10) When inserting or removing of your signal cable to TFT-LCD Module, be sure not to apply abnormal force (rotate, tilt…etc.) to the Connector of the TFT-LCD Module.
11) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.
12) Small amount of materials without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
13) Severe temperature condition may result in different luminance, response time.
14) Continuous operating TFT-LCD Module under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
15) The data on this specification sheet is applicable when TFT-LCD module is placed in landscape position.
16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or moving content periodically if fixed pattern is displayed on the screen.

2. General Description

G065VN01 V2 is designed for industrial display applications with VGA (640 x RGB x 480) resolution and 16.2M (RGB 6-bits + FRC) or 262k colors (RGB 6-bits). It is composed of a TFT-LCD panel, driver ICs, control and power supply circuits board and a backlight unit including LED driving circuit. G065VN01 V2 offers LVDS interface for display signal input.

2.1 Display Characteristics

The following items are G065VN01 V2 characteristics summary at 25 □(Room Temperature).

Items	Unit	Specifications
Screen Diagonal	inch	6.5
Active Area	mm	132.48(H) x 99.36(V)
Pixels H x V		640x3(RGB) x 480
Pixel Pitch	mm	0.207 x 0.207
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	Volt	3.3 typ.
Typical Power Consumption	Watt	3.86W (LCD:0.86W/LED BLU: 3.0W) All black pattern
Weight	Grams	170g (typ.)
Physical Size	mm	153.0(H)x 118.0(V) x 10.9(D) (typ.)
Electrical Interface		1 channel LVDS
Surface Treatment		Glare, AR, Hardness: 3H
Support Color		16.2M / 262K colors
The most suitable view angle		6 o'clock
Temperature Range Operating Storage (Non-Operating)	 °C °C	 -30 to +80* -30 to +80* *Panel surface temperature
RoHS Compliance		RoHS Compliance

2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25□ (Room Temperature).

Item	Unit	Conditions	Min.	Typ.	Max.	Remark
White Luminance	cd/m2	F_{PWM} = 100% (center point)	600	800	-	Note 1
Uniformity	%	5 Points		-	1.25	Note 1, 2, 3
Contrast Ratio			400	600	-	Note 4
Response Time	msec	Rising	_	15	20	Note 5
	msec	Falling	-	10	15	
	msec	Rising + Falling	-	25	35	
Viewing Angle	degree degree	Horizontal (Right) CR = 10 (Left)	70 70	80 80	- -	Note 6
	degree degree	Vertical (Upper) CR = 10 (Lower)	60 60	70 70	- -	
Color / Chromaticity Coordinates (CIE 1931)		White x	0.263	0.313	0.363	
		White y	0.279	0.329	0.379	
		Red x	0.559	0.609	0.659	
		Red y	0.314	0.364	0.414	
		Green x	0.285	0.335	0.385	
		Green y	0.554	0.604	0.654	
		Blue x	0.099	0.149	0.159	
		Blue y	0.055	0.105	0.155	
Color Gamut	%		50	55	-	

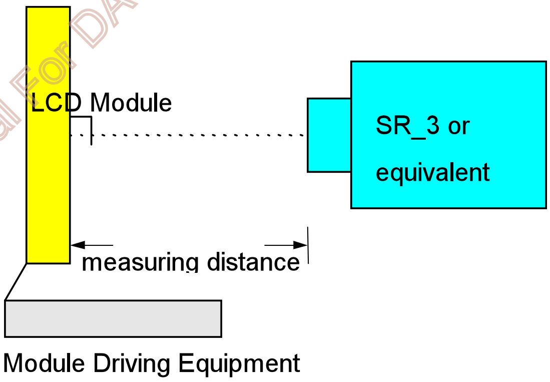
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

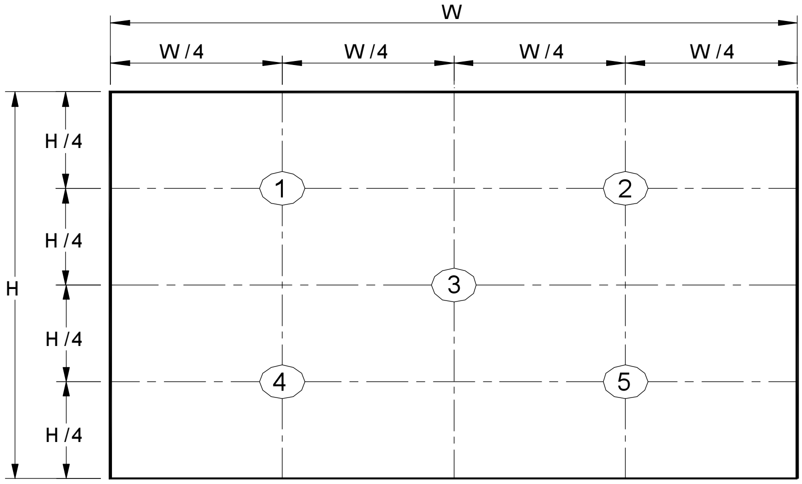
Aperture 1□with 50cm viewing distance

Test Point Center

Environment < *1 lux*



Note 2: Definition of 5 points position (Display active area: 132.48mm(W) x 99.36mm(H))



Note 3:
The luminance uniformity of 5 points is defined by dividing the maximum luminance value by the minimum luminance value at full white condition.

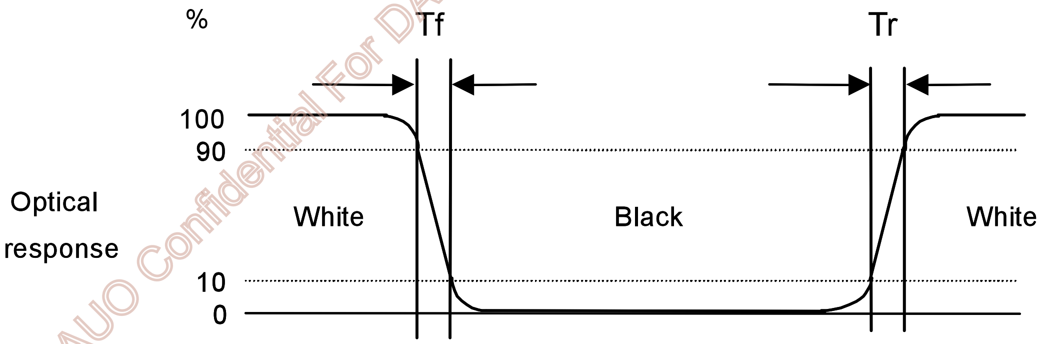
$$\delta_{W5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

Note 4: Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness @ “White” state}}{\text{Brightness @ “Black” state}}$$

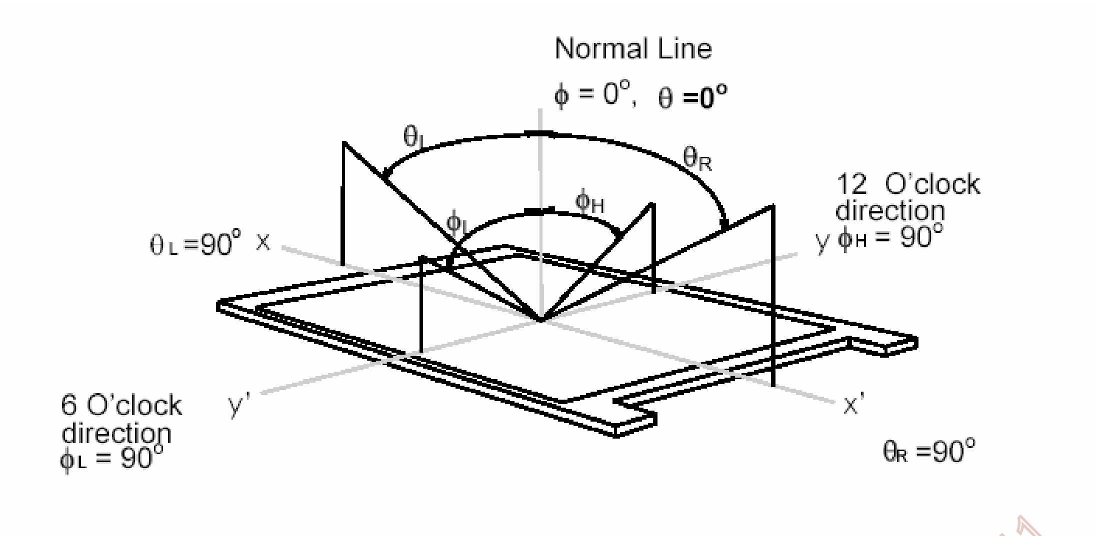
Note 5: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “White” to “Black” (falling time) and from “Black” to “White” (rising time), respectively. The response time interval definition is between 10% and 90% of amplitude. Please refer to the figure as below.



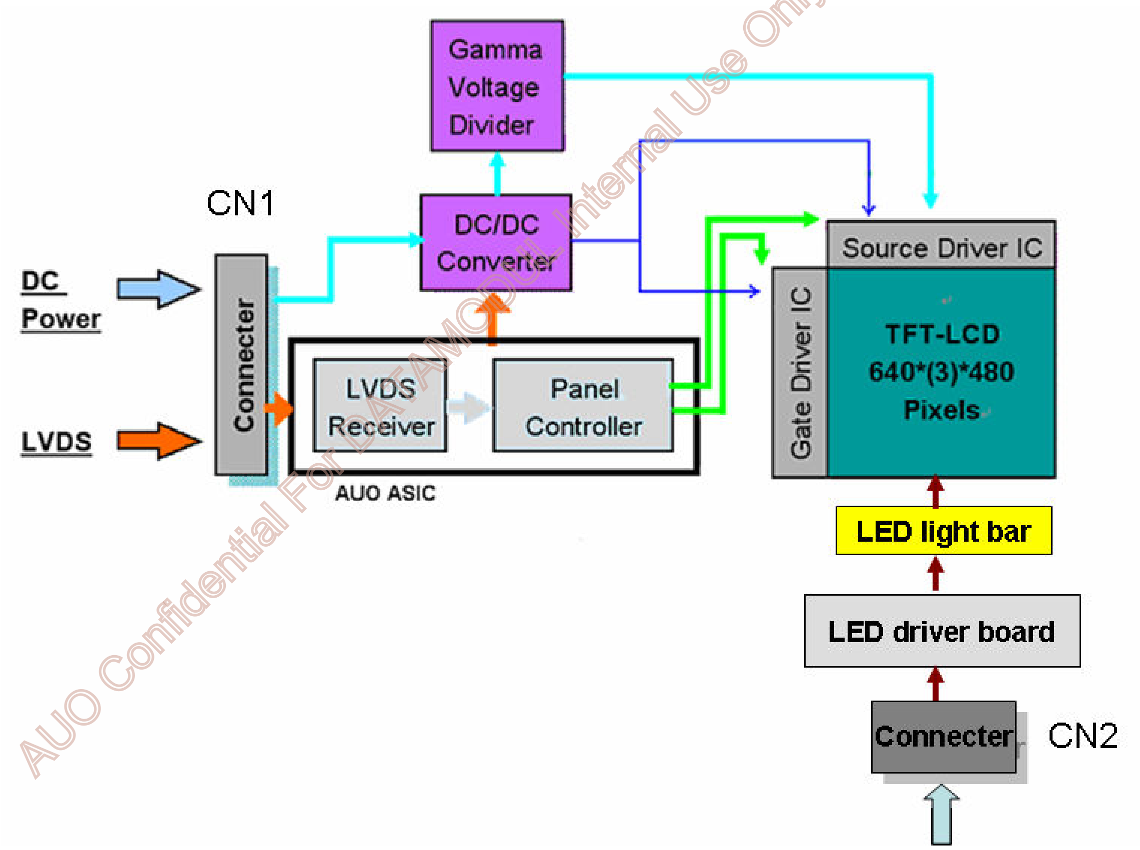
Note 6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio □10, at the screen center, over 180° horizontal and 180° vertical range. The 180° horizontal (θ_L, θ_R) and 180° vertical (Φ_H, Φ_L) range are illustrated as following figure.



3. Functional Block Diagram

The following diagram shows the functional block of the G065VN01 V2 color TFT/LCD module.



4. Absolute Maximum Ratings

4.1 Absolute Ratings

Item	Symbo	Min	Max	Unit	Remark
Logic/LCD Drive Voltage	VDD	-0.3	+4.0	Volt	Ta= 25°C
LCD Input Signal Voltage	VIN	-0.3	+4.0	Volt	Ta= 25°C
LED BLU Drive Voltage	V_{LED}	0	16	Volt	Ta= 25°C
LED Dimming Input Voltage	V_{PWM}	0	6	Volt	Ta= 25°C

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit	Remark
Operating Temperature	TOP	-30	+80*	℃	Note 1, 2
Operation Humidity	HOP	5	95	%RH	Note 1, 2
Storage Temperature	TST	-30	+80*	℃	Note 1
Storage Humidity	HST	5	95	%RH	Note 1

Note 1: Maximum Wet-Bulb should be 39□ and no condensation.

Note 2: Only operation is guaranteed. Optical and display performance should be evaluated at 25□ only.

*: Panel surface temperature

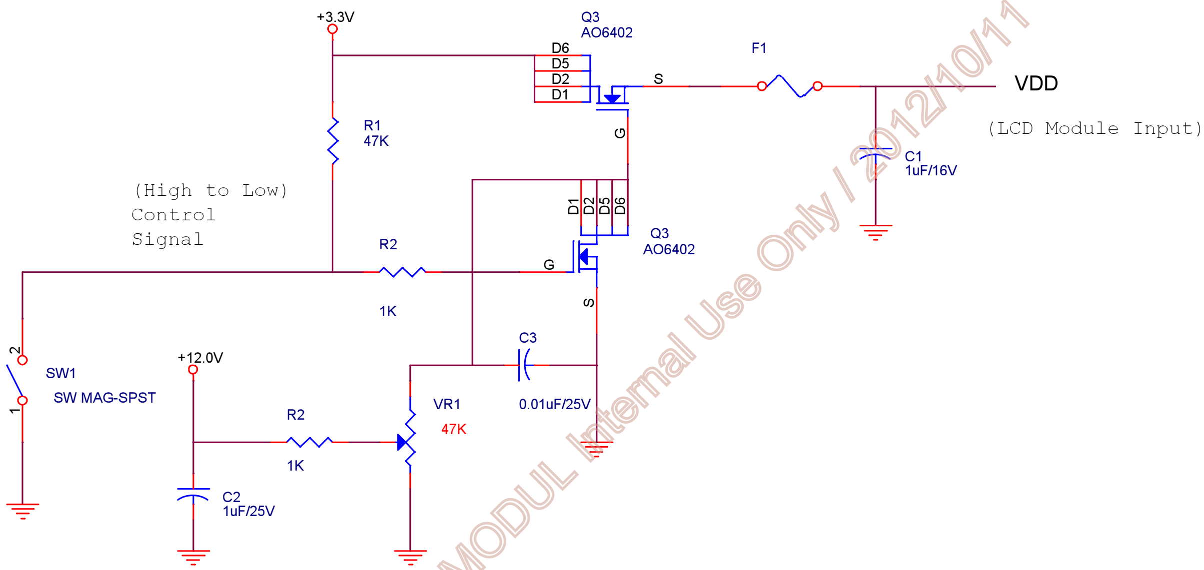
5. Electrical Characteristics

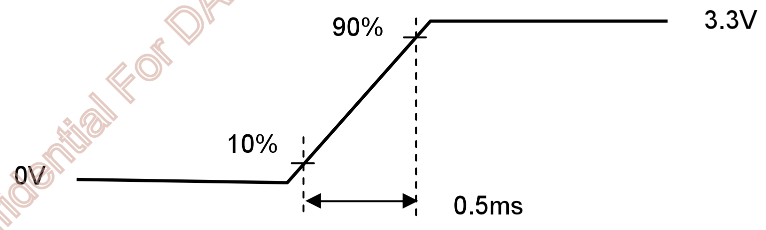
5.1 TFT-LCD Driving

5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	Volt	
IDD	VDD Current	-	260	300	mA	All Black Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	1.5	A	Note 1
PDD	VDD Power	-	0.86		Watt	All Black Pattern (VDD=3.3V, at 60Hz)
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	mVp-p	All Black Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:





VDD rising time

5.1.2 Signal Electrical Characteristics

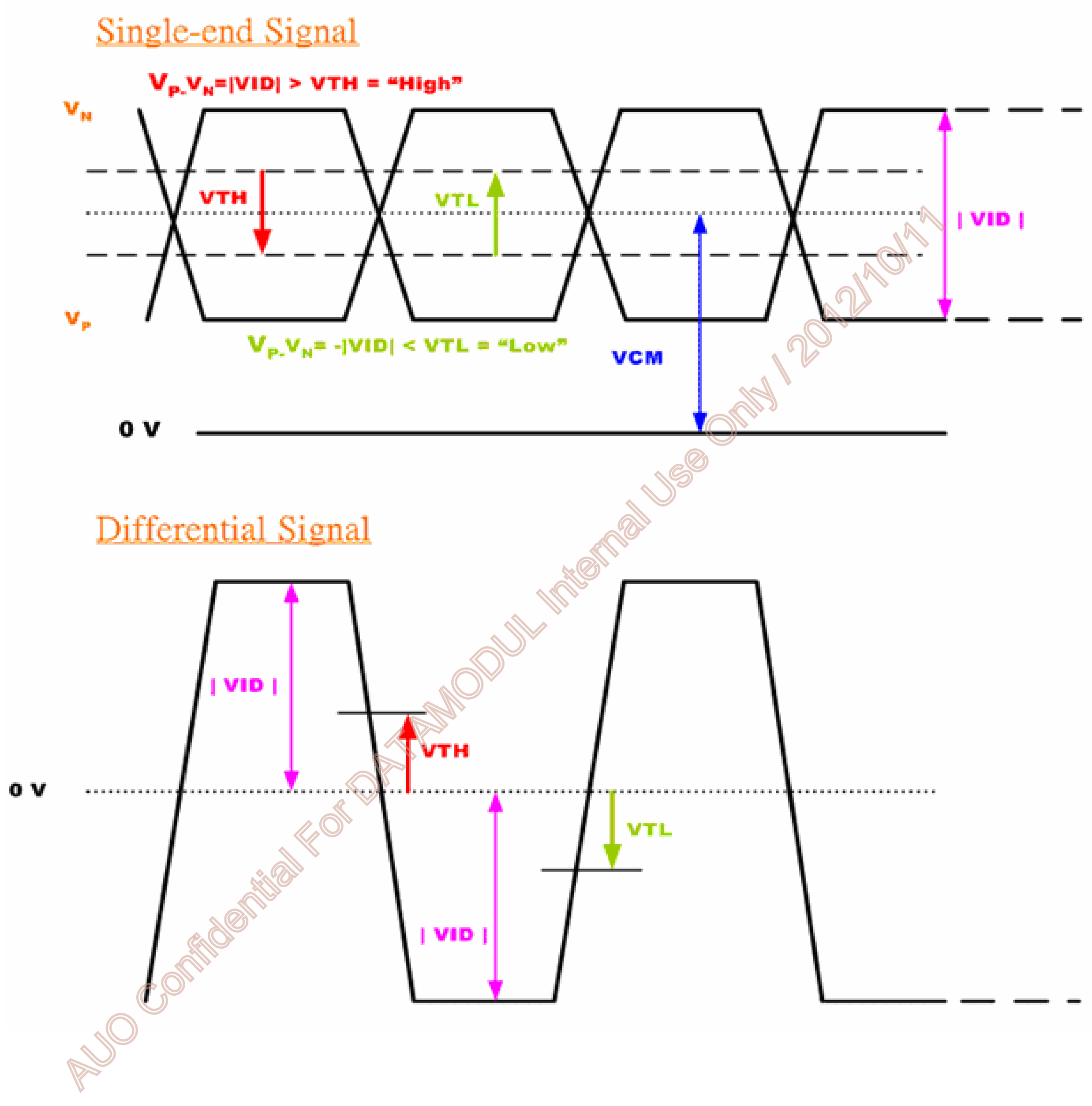
Input signals shall be low or Hi-Z state when VDD is off.

LVDS signal (Note 1)

LVDS Transmitter: THC63LVDM83A (THINE) or equivalent

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Differential Input High Threshold	VTH	-	-	100	mV	VCM=1.20V
Differential Input Low Threshold	VTL	-100	-	-	mV	VCM=1.20V
Input Differential Voltage	∣ VID ∣	100	400	600	mV	
Differential Input Common Mode Voltage	VCM	1.1	-	1.45	V	VTH, VTL= ±100mV

Note 1: LVDS Signal Waveform.



5.2 Backlight Unit Driving

5.2.1 Parameter guideline for LED driver

Following characteristics are measured under stable condition at 25 (Room Temperature).

Symbol	Parameter	Min	Typ	Max	Units	Remark
V_{LED}	Input Voltage	9	12	13	Volt	
I_{LED}	Input Current	-	0.25		A	100% PWM duty
P_{LED}	Power Consumption	-	3.0		W	100% PWM duty
$Irush_{LED}$	Inrush Current	-	0.37	0.41	A	100% PWM duty
$V_{LED\ On/Off}$	On Control Voltage	3.0	3.3	5.0	Volt	
	Off Control Voltage	0		0.15	Volt	
V_{PWM}	Dimming control Voltage High	3.0	3.3	5.0	Volt	
	Dimming control Voltage Low	0		0.1	Volt	
F_{PWM}	Dimming Frequency	200		30K	Hz	
D_{PWM}	Dimming duty cycle	1		100	%	
Operating Life		50000			Hrs	Note 2, 3

Note 1: See Section 6.6 for LED Backlight Unit Interface Signal Description.

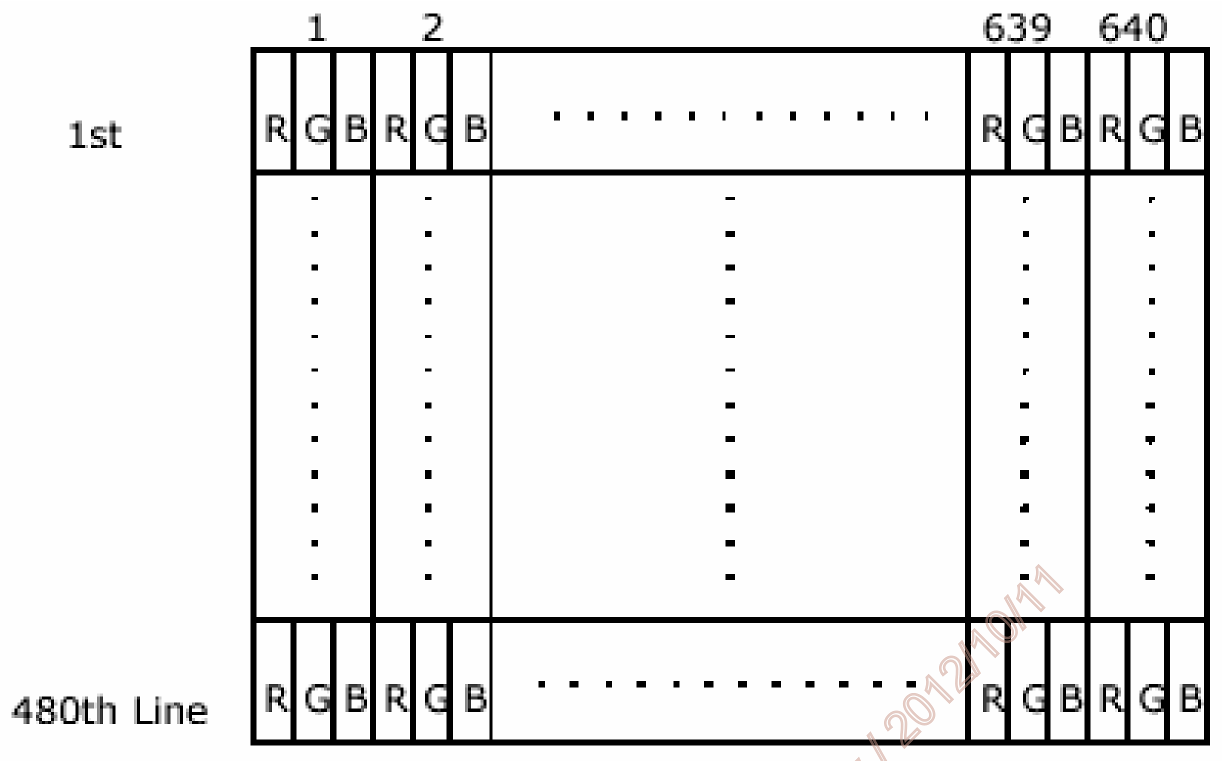
Note 2: If G065VN01 V2 module is driven at high ambient temperature & humidity condition. The operating life will be reduced.

Note 3: Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

6. Signal Characteristic

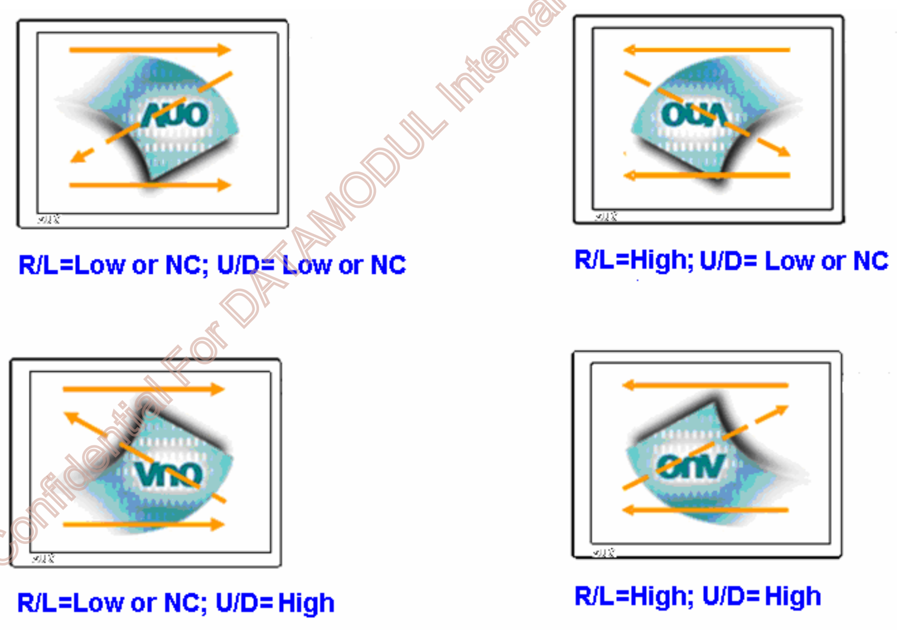
6.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.



6.2 Scanning Direction

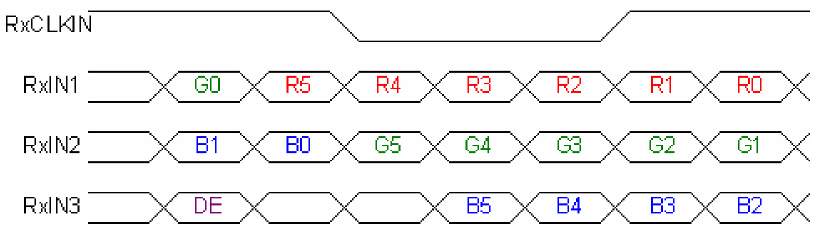
The following figures show the image seen from the front view. The arrow indicates the direction of scan.



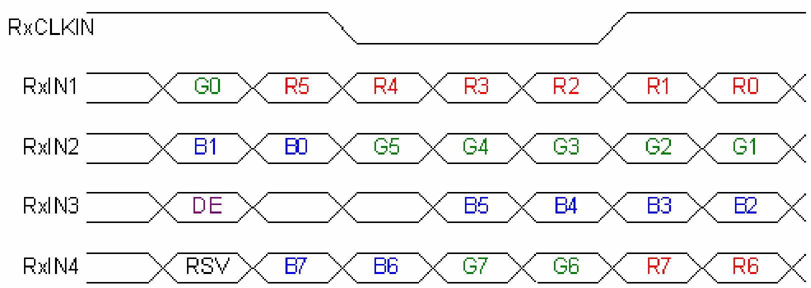
Note 1: TFT-LCD interface signal description is shown in section 6.4.

6.3 The Input Data Format

SEL68 = "Low" or "NC" for 6 bits LVDS Input



SEL68 = "High" for 8 bits LVDS Input



Signal Name	Description	Remark
R7	Red Data 7	Red-pixel Data
R6	Red Data 6	
R5	Red Data 5	For 8Bits LVDS input
R4	Red Data 4	MSB: R7 ; LSB: R0
R3	Red Data 3	
R2	Red Data 2	For 6Bits LVDS input
R1	Red Data 1	MSB: R5 ; LSB: R0
R0	Red Data 0	
G7	Green Data 7	Green-pixel Data
G6	Green Data 6	
G5	Green Data 5	For 8Bits LVDS input
G4	Green Data 4	MSB: G7 ; LSB: G0
G3	Green Data 3	
G2	Green Data 2	For 6Bits LVDS input
G1	Green Data 1	MSB: G5 ; LSB: G0
G0	Green Data 0	
B7	Blue Data 7	Blue-pixel Data
B6	Blue Data 6	
B5	Blue Data 5	For 8Bits LVDS input
B4	Blue Data 4	MSB: B7 ; LSB: B0
B3	Blue Data 3	
B2	Blue Data 2	For 6Bits LVDS input
B1	Blue Data 1	MSB: B5 ; LSB: B0
B0	Blue Data 0	
RxCLKIN	LVDS Data Clock	
DE	Data Enable Signal	When the signal is high, the pixel data shall be valid to be displayed.
RSV	Reserved Signal	"High" or "Low" is acceptable

Note 1: Output signals from any system shall be low or Hi-Z state when VDD is off.

6.4 TFT- LCD Interface Signal Description

G065VN01 V2 TFT-LCD module includes LVDS receiver. LVDS is a differential signal technology for high-speed data transfer LCD interface. LVDS Transmitter shall be THC63LVDM83A (THINE) or equivalent.

Pin No.	Symbol	Pin Description
1	VDD	Power supply, 3.3V (typical)
2	VDD	Power supply, 3.3V (typical)
3	GND	Ground
4	SEL68	Selection for either 6bit or 8bit LVDS input: SEL68 =”Low” or “NC”, accepts 6bit LVDS data input; SEL68 = ”High”, accepts 8bit LVDS data input.
5	RxIN1-	Negative LVDS differential input (R0-R5, G0)
6	RxIN1+	Positive LVDS differential input (R0-R5, G0)
7	GND	Ground
8	RxIN2-	Negative LVDS differential input (G1-G5, B0-B1)
9	RxIN2+	Positive LVDS differential input (G1-G5, B0-B1)
10	GND	Ground
11	RxIN3-	Negative LVDS differential input (B2-B5, DE)
12	RxIN3+	Positive LVDS differential input (B2-B5, DE)
13	GND	Ground
14	RxCLKIN-	Negative LVDS differential clock input
15	RxCLKIN+	Positive LVDS differential clock input
16	NC	No connection
17	U/D	Vertical Reverse (“L” or NC: Normal, “H”: Reverse)
18	R/L	Horizontal Reverse (“L” or NC: Normal, “H”: Reverse)
19	RxIN4-	Negative LVDS differential input (R6-R7, G6-G7, B6-B7) NC for 6bit LVDS input.
20	RxIN4+	Positive LVDS differential input (R6-R7, G6-G7, B6-B7) NC for 6bit LVDS input.

Note 1: “Low” stands for 0V. “High” stands for 3.3V. “NC” stands for ”No Connection”.

6.5 TFT- LCD Interface Timing

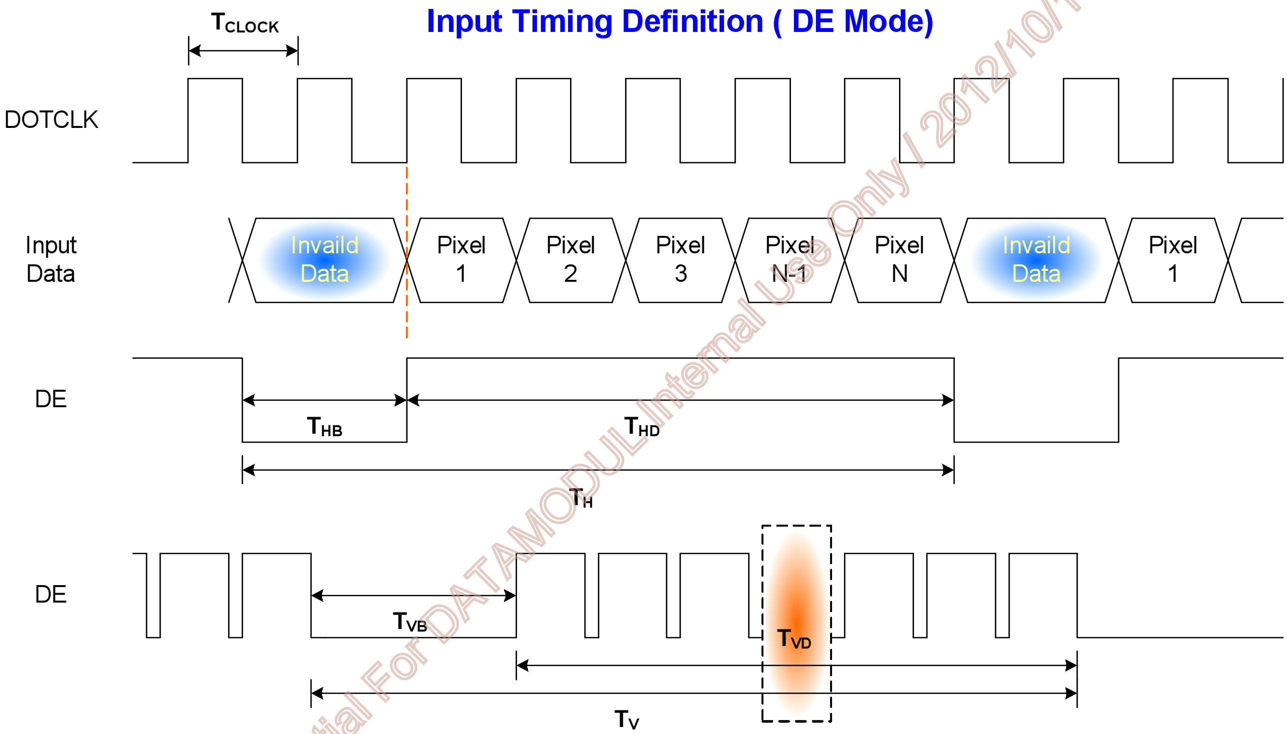
6.5.1 Timing Characteristics

DE mode only

Signal		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency (DOTCLK)		1/ T_{CLOCK}	20	25.2	50	MHz	Note1
Horizontal Section	Period	T_H	770	800	1070	T_{CLOCK}	Note1
	Active	T_{HD}		640			
	Blanking	T_{HB}	130	160	430		
Vertical Section	Period	T_V	520	525	622	T_{LINE}	Note1
	Active	T_{VD}		480			
	Blanking	T_{VB}	40	45	142		

Note 1: Recommended frame rate is 60 Hz.

6.5.2 Input Timing Diagram



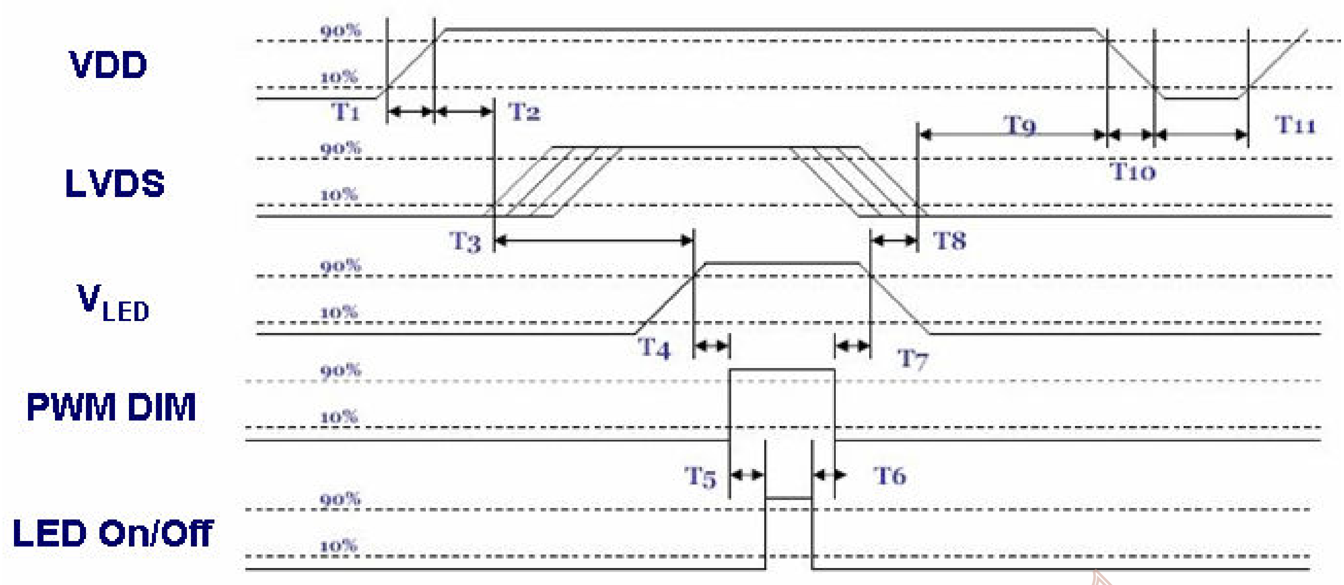
6.6 LED Backlight Unit Interface Signal Description

Pin #	Symbol	Pin Description
1	V_{LED}	12V input
2	V_{LED}	12V input
3	GND	Ground
4	GND	Ground
5	LED On/Off	3.3V-On; 0V/NC-Off
6	PWM DIM	1~100%

Note1: “NC stands for “No Connection””.

6.7 Power ON/OFF Sequence

VDD power, LCD interface signals and backlight on/off sequence are shown in the following chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	30	40	50	ms
T3	200	-	-	ms
T4	10	-	-	ms
T5	10	-	-	ms
T6	0	-	-	ms
T7	10	-	-	ms
T8	100	-	-	ms
T9	0	16	50	ms
T10	-	-	10	ms
T11	1000	-	-	ms

ON/OFF sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

7. Connector & Pin Assignment

7.1 TFT- LCD Signal (CN1): LCD Connector

Manufacturer	STM
Connector Model Number	MSB24013P20, compatible with I-PEX 20268-020E
Mating Connecter Model Number	Hirose DF19 -20S-1C or compatible

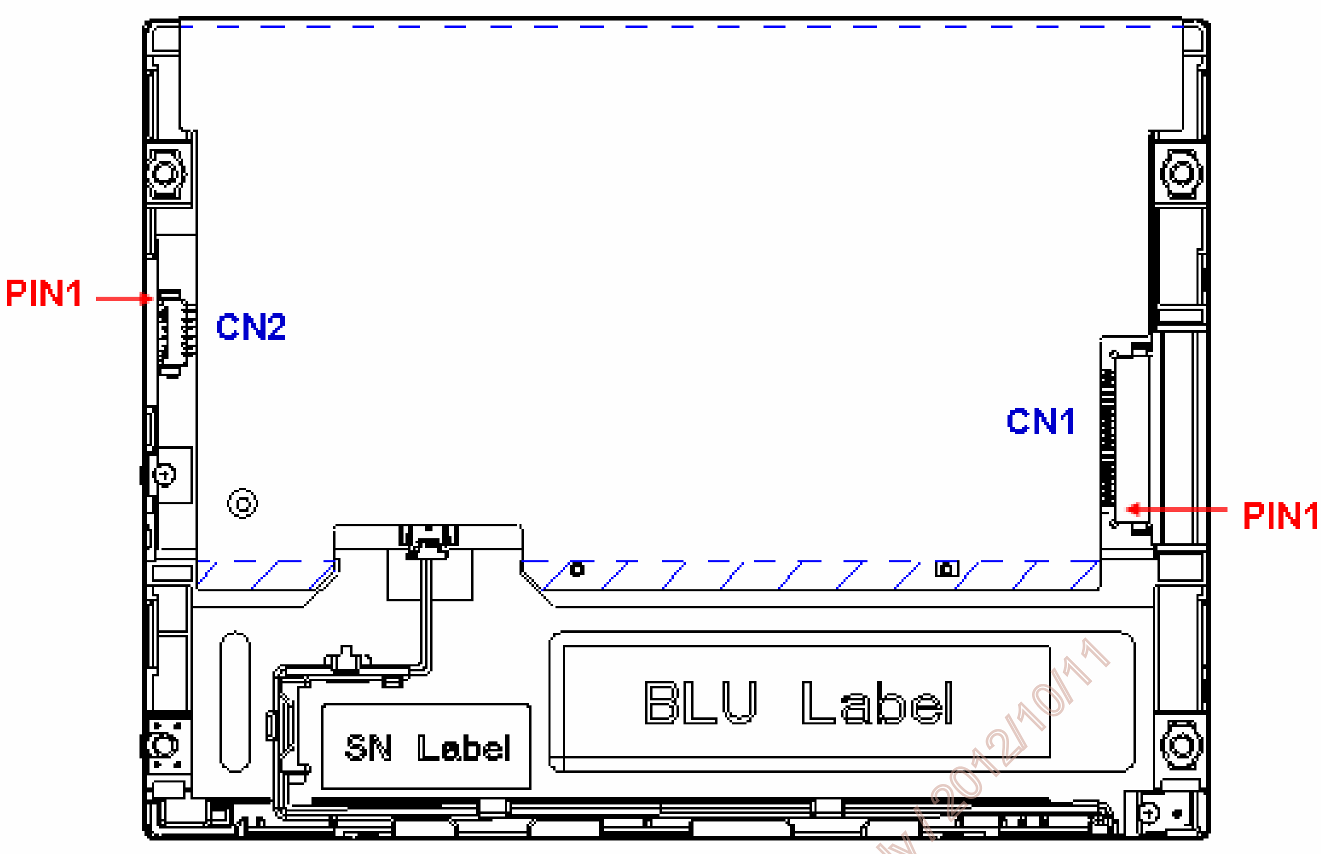
Pin#	Symbol	Pin#	Symbol
1	VDD	11	RxIN3-
2	VDD	12	RxIN3+
3	GND	13	GND
4	SEL68	14	RxCLKIN-
5	RxIN1-	15	RxCLKIN+
6	RxIN1+	16	NC
7	GND	17	U/D
8	RxIN2-	18	R/L
9	RxIN2+	19	RxIN4-
10	GND	20	RxIN4+

7.2 LED Backlight Unit (CN2): Backlight Connector

Manufacturer	STM
Connector Model Number	MS24016RHD, compatible with MOLEX 53261-0671
Mating Connecter Model Number	STM P24016 or compatible

Pin #	Symbol	Pin #	Symbol
1	V_{LED}	4	GND
2	V_{LED}	5	LED ON/OFF
3	GND	6	PWM DIM

7.3 PIN 1 definition of CN1 and CN2



(Rear side of TFT-LCD)

8. Reliability Test Criteria

Items	Required Condition	Remark
Temperature Humidity Bias	40□/90%, 300Hr	Note 2
High Temperature Operation	80□*, 300Hr	Note 2
Low Temperature Operation	-30□, 300Hr	Note 2
High Temperature Storage	80□*, 300 hours	Note 2
Low Temperature Storage	-30℃, 300 hours	Note 2
Thermal Shock Test	-30℃/30 min, 80℃*/30 min, 100cycles	Note 2
Hot Start Test	80℃*/1 Hr (min.), power on/off per 5 minutes, repeat 5 times	Note 2
Cold Start Test	-30℃/1 Hr (min.), power on/off per 5 minutes, repeat 5 times	Note 2
Shock Test (Non-Operating)	50G,20ms,Half-sine wave, (±X, ±Y, ±Z)	Note 2
Vibration Test (Non-Operating)	1.5G, 10~200~10Hz, Sine wave, 30mins/axis, 3 direction (X, Y, Z)	Note 2
ESD	Contact Discharge: ±8KV, 150pF(330Ω) 1sec, 8 points, 25 times/point Air Discharge: ±15KV, 150pF(330Ω) 1sec, 8 points, 25 times/point	Note 1,2
Attitude Test	Operating: 14,000 ft, Ramp: 2000 ft/min, 8hrs Non-operating: 40,000 ft, Ramp: 2000 ft/min, 24hrs	Note 2

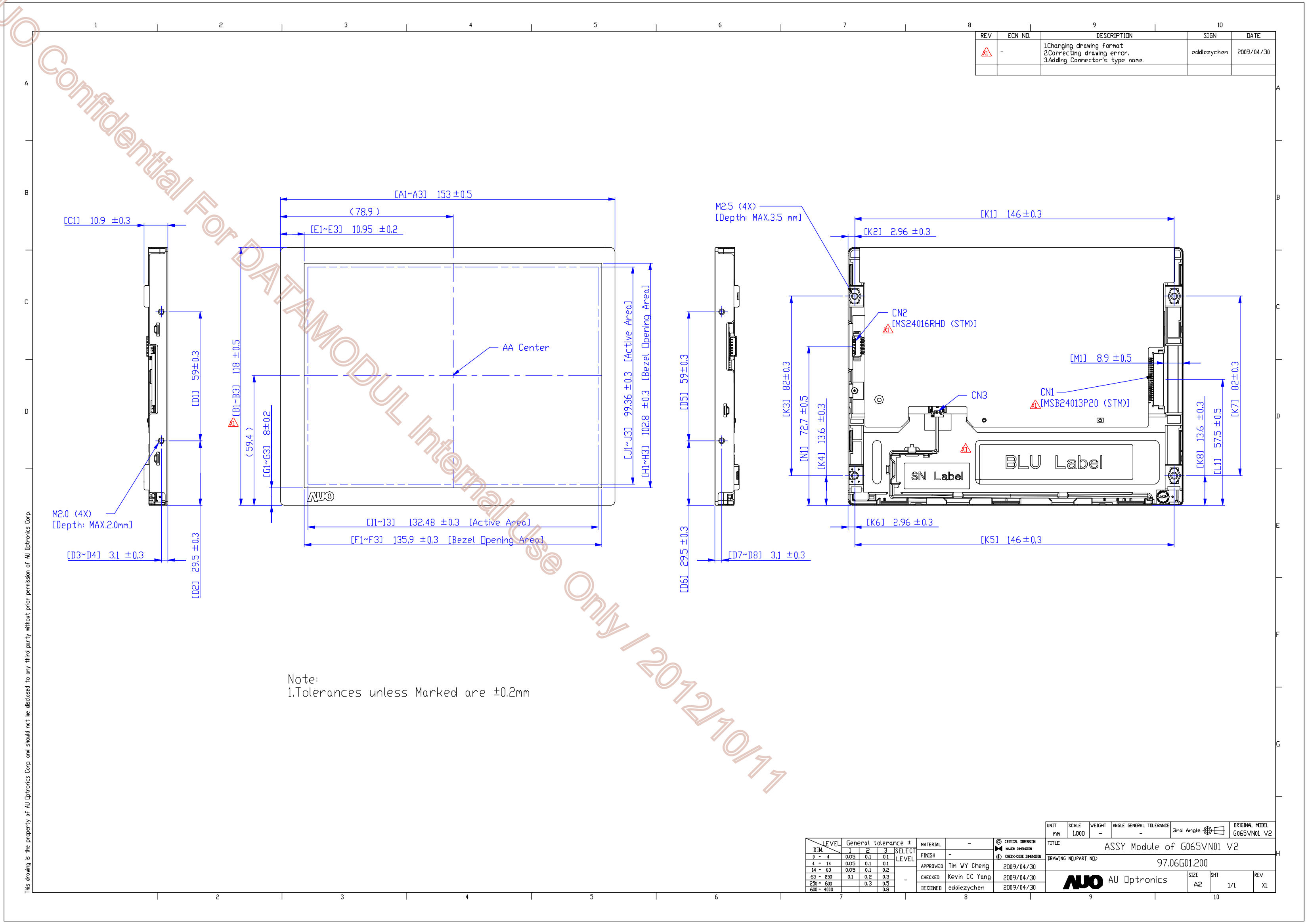
Note1: According to EN61000-4-2 ESD class B criteria, some performance degradation is allowed. TFT-LCD module is self-recoverable, no data lost and no hardware failures after test.

Note2:

- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD module capability.
- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.

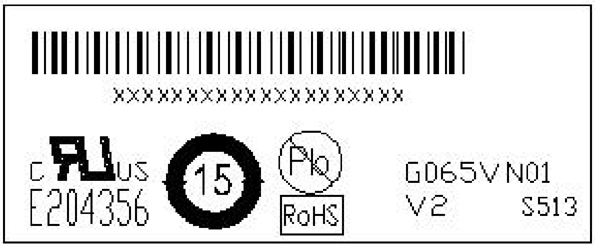
*: Panel surface temperature

9. Mechanical Characteristics



10. Label and Packaging

10.1 Shipping Label (on the rear side of TFT-LCD display)

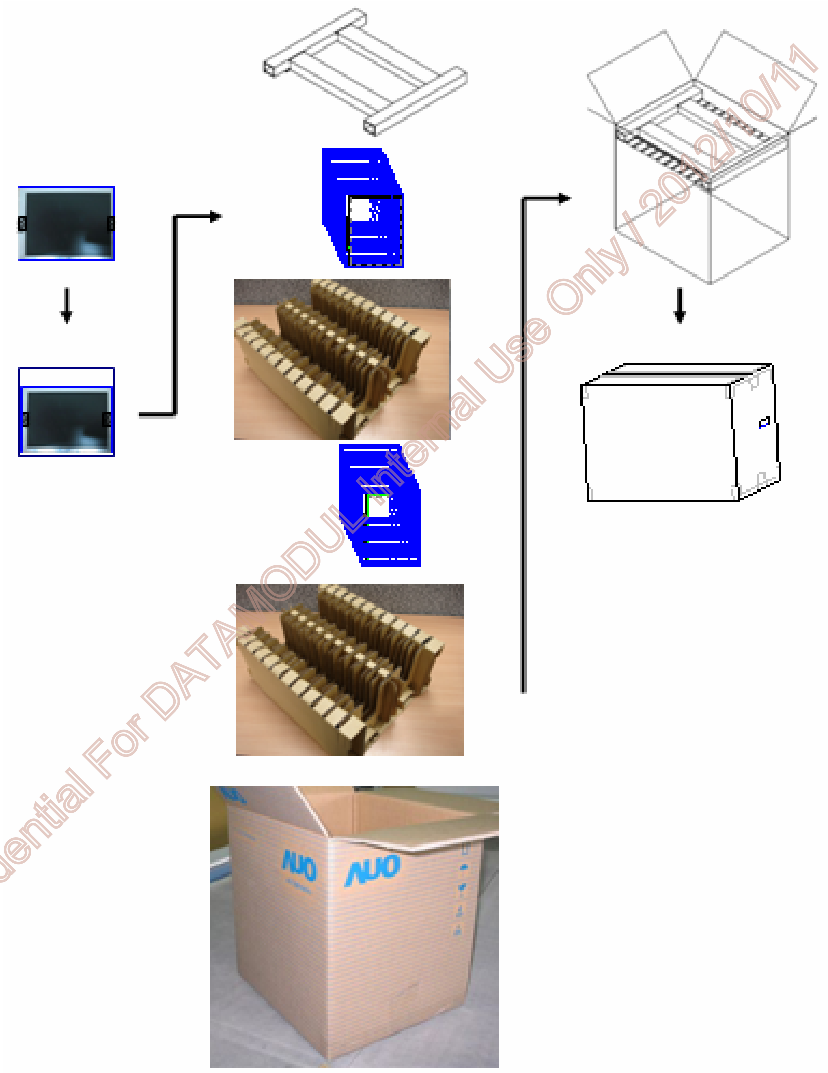


10.2 Carton Package

Max. capacity: 80 TFT-LCD module per carton (40pcs * 2 layers)

Max. weight: 16.6 kg per carton

Outside dimension of carton: 425(L)mm* 386(W)mm* 430(H)mm



11 Safety

11.1 Keen Edge Requirements

There will be no keen edges or corners on the display assembly that could cause injury.

11.2 Materials

11.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the TFT-LCD module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

11.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the TFT-LCD Module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

11.3 Capacitors

If any polarized capacitors are used in the TFT-LCD module, provisions will be made to keep them from being inserted backwards.

11.4 National Test Lab Requirement

The TFT-LCD Module will satisfy all requirements for compliance to UL 60950 (U.S.A. Information Technology Equipment).

Specification

AST/ATP Series
Revision 11

Version March 23, 2010

Table of Contents

1. Product Specifications

1-1. Product Applicable

§ This specification is applied to the analog resistive touchscreen: ATP/AST Series.

1-2. Structure

§ Dimensions, structure, and shape are referred on the drawing attached.

1-3. Environmental Specifications

Specification	Value
Operating Temperature	-20°C to 70°C (no condensation)
Operating Humidity	-20°C to 60°C Less than 90%RH (no condensation) Exceeding 60°C 133.8g/m^3 (no condensation)
Storage Temperature	-40°C to 80°C (no condensation)
Storage Humidity	-40°C to 60°C Less than 95%RH (no condensation) Exceeding 60°C 142.9g/m^3 (no condensation)
Chemical Resistance (top surface)	Toluene, Tricholoroethylene, Athetone, Alcohol, Gasoline, Machine Oil, Ammonia, Glass Cleaner, Mayonnaise, Ketchup, Wine, Salad Oil, Vinegar, Lipstick, etc.

1-4. Mechanical Characteristics

Specification	Value	
Activation Force	0.05N to 0.8N	
Operating Life	Input (finger)	10,000,000 hits
	Character Input (pen)	100,000 characters
Light Transmittance	Over 80% (typical value at full wavelength)	
Surface Hardness	Over 2H (by JIS pencil hardness)	

1-5. Electrical Characteristics

Specification	Value	
Maximum Voltage	DC6V	
Maximum Current	Top Electrode	100mA
	Bottom Electrode	100mA
	Between the Top and Bottom	0.5mA
Linearity	Under ±2% (Under ±1% (typical value))	
Terminal Resistance	Top Electrode	Less than 1kΩ
	Bottom Electrode	Less than 1kΩ
Insulation Resistance	Neighboring Terminals	Over 20MΩ at 25V
	Active Area Electrodes	Over 20MΩ at 25V
Chattering	Less than 10msec at ON/OFF.	

1-6. Appearance

§ Scratch, dust (W = width, L = length, D = average diameter = (longest + shortest) /2)

Item	Width (mm)	Length (mm)	Acceptable Numbers	Total
Linear(Scratch/Dust) Over 0.1mm in diameter refer to the Circular.	0.1≥W>0.05	4≥L	1pcs in ϕ30mm	Within 5pcs /panel
	0.05≥W>0.03	10≥L	2pcs in ϕ20mm	
	0.03≥W	20≥L	Acceptable	
Circular (Scratch/Dust)	0.4≥D>0.3 *1		1pcs in viewing area *1	
	0.3≥D>0.2		2pcs in ϕ30mm	
	0.2≥D		Acceptable	

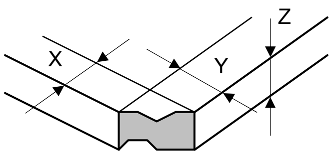
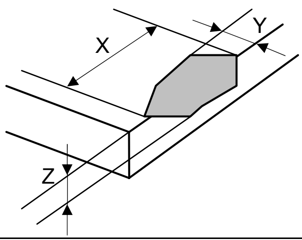
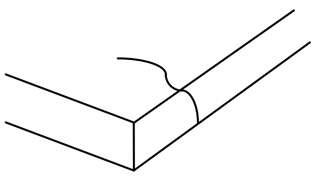
Applied only in the Active Area. Scratches or dusts in the outside of the Active Area are acceptable unless the electrical characteristics are affected.

*1 Applied to the size of 14 inches or more.

§ Dirt

Acceptable if not noticeable on a black mat.

§ Tip, crack (t = glass thickness) (applicable only for the glass)

<table>
<tr><th>Item</th><th colspan="3">Size (mm)</th><th>Acceptable Numbers</th></tr>
<tr><td rowspan="3">Corner</td><td rowspan="3"></td><td>X</td><td>≤3</td><td rowspan="3">2pcs /panel</td></tr>
<tr><td>Y</td><td>≤3</td></tr>
<tr><td>Z</td><td>≤t</td></tr>
<tr><td rowspan="3">Side</td><td rowspan="3"></td><td>X</td><td>≤5</td><td rowspan="3">2pcs /side</td></tr>
<tr><td>Y</td><td>≤3</td></tr>
<tr><td>Z</td><td>≤t</td></tr>
<tr><td>Crack</td><td colspan="3"></td><td>Not acceptable</td></tr>
</table>

2. Testing Regulation

2-1. Testing Regulation

§ If the regulation is not specified, the test is performed under the supplier's regulation.

§ Tests are performed under the room temperature unless specified. The room temperature is referred as follows:

Temperature: 20°C±5°C
Humidity: 65%±10%RH

2-2. Environmental Specifications

§ Chemical Resistance Test

Condition: Tested after leaving the chemical on the surface for 12 hours being wiped off by cloth.

Judgement: Must be no effect in appearance.

2-3. Mechanical Characteristics

§ Activation Force Test

Condition: Measured by depressing the point between the dots to the conduction by the testing rod (Figure 1).

Judgement: Must satisfy the specification.

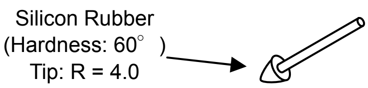


Figure 1. Testing rod 1

§ Operating Life Test (Finger)

Condition:
Testing rod: Refer to Figure 1
Voltage: DC5V
Load: 3N
Cycle: 2 hits/sec

Judgement: Must satisfy the following:

Activation Force:	Must satisfy the specification.
Linearity:	Must satisfy the specification.
Terminal Resistance:	Must satisfy the specification.
Insulation Resistance:	Must satisfy the specification.

§ Operating Life Test (Pen)

Condition:
Testing rod: Refer to Figure 2
Voltage: DC5V
Load: 2.5N
Input size: 10 x 10 mm
Input character: A to Z/minute

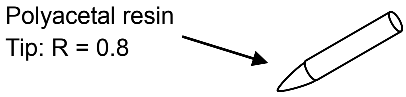


Figure 2. Testing rod 2

Judgement: Must satisfy the following:

Activation Force:	Must satisfy the specification.
Linearity:	Must satisfy the specification.
Terminal Resistance:	Must satisfy the specification.
Insulation Resistance:	Must satisfy the specification.

2-4. Electrical Characteristics

§ Terminal Resistance Test

Condition: Top and bottom electrodes are measured at the terminal.

Judgement: Must satisfy the specification.

§ Insulation Resistance Test

Neighboring Terminals: Measured by applying the reference voltage to the terminals
Active Area Electrodes: Measured by applying the reference voltage to the top and bottom electrodes.

Judgement: Must satisfy the specification.

2-5. Appearance

§ Appearance Test

Condition: Tested by an examiner with over 1.0 eyesight at 30cm away from the product under the transmittable light at over 60° the surface of the product.

Judgement: Must satisfy the specification.

3. Reliability Condition

3-1. Temperature Condition

§ Temperature Condition Test

Following test are performed in the condition with no dew condensation:

Cold Test: Tested after leaving the parts in -40°C±3°C for 240 hours and in the room temperature for 2 hours.

Heat Test: Tested after leaving the parts in 80°C±3°C for 240 hours and in the room temperature for 2 hours.

Humidity Test: Tested after leaving the parts in the temperature 60°C±3°C, humidity 90 to 95% for 240 hours and in the room temperature for 2 hours.

Cycle Test: Tested after 5 cycles of leaving the parts in the temperature -30°C±3°C for 1 hour and in the room temperature for 0.5 hours, then leaving the parts in the temperature 70°C±3°C for 1 hour and in the room temperature for 0.5 hours.

Judgement: Must satisfy the following:

Activation Force:	Must satisfy the specification.
Linearity:	Must satisfy the specification.
Terminal Resistance:	Must satisfy the specification.
Insulation Resistance:	Must satisfy the specification.
Appearance:	Must satisfy the specification.

4. Recommended Connector

4-1. Recommended Connector

Part No.	Pins	Pitch
KCA-K4R	4 pin Double-sided	1.25mm

5. Handling Notes

5-1. Precautions

§ This product is intended for use in standard applications (computers, office automation, and other office equipment, industrial, communications, and measurement equipment, personal and household devices, etc.) Please avoid using this product for special applications where failure or abnormal operation may directly affect human lives, or cause physical injury or property damage, or where extremely high levels of reliability are required (such as aerospace systems, vehicle operating control, atomic energy controls, medical devices for life support, etc.).

5-2. Handling Notes

§ Do not depress or scratch the product with any object with a sharp edge or end.

§ Do not forcibly bend or fold the product.

§ When the product is stored, make sure it is packed in a packing box and stored in a storage temperature range, eliminating any outside load.

§ Do not use or store the product under a condition where the product will be exposed to water, organic solution or acid.

§ Do not use the product under the direct sunlight.

§ Do not disassemble the product.

§ When you handle the product, Hold the product by its body. Do not hold by the tail.

§ Clean the product with a soft cloth or a soft cloth with neutral detergent or alcohol. When contaminated by chemicals, wipe them off immediately with caution not to cause injury to human body.

§ The edge of the glass is not rounded and may cause injury.

5-3. Construction Notes

§ The environmental specifications, mechanical characteristics, and electrical characteristics are only applied to the Active Area.

§ Do not use the touchscreen when the condensation occurs. The condensation inside of the touchscreen is a natural phenomenon and should disappear after the touchscreen is warmed up.

5-4. Electrical & Software Notice

The best performance can be obtained when used with the original analog resistive touchscreen controller, “TSC-10” Series. If the touchscreen controller or controller software is to be developed by the customer, please note the following:

§ There is a contact resistance between the top and bottom electrodes and it changes by the pressure of a finger or a pen. The data must be read after the contact resistance becomes stabilized.

§ The terminal resistance of the analog resistive touchscreen varies by the individual, time, and environment. The controller software must have the calibration function to adjust the input position and the display position.

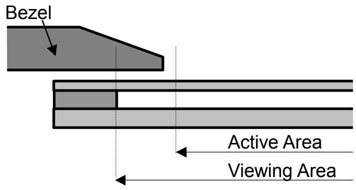
§ The analog resistive touchscreen outputs 2 point input as 1 point in between the 2 points. The controller software must not be designed to have the 2 point input function.

§ For drawing applications, the line may be intermittent when the pen comes on the dot spacers. A software compensation is needed.

5-5. Mounting Notes

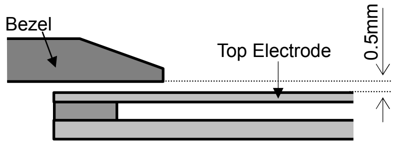
§ Bezel Edge

Bezel edge must be positioned in the area between the Active Area and the Viewing Area. The bezel may press the touchscreen and cause input if the edge enters the Active Area.



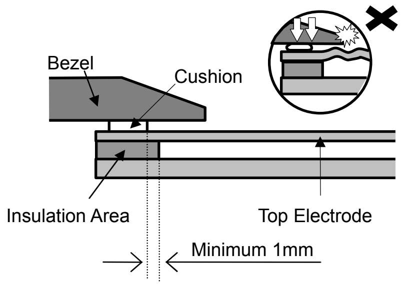
§ Gap between the Bezel and Touchscreen

A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected input if the gap is too narrow.



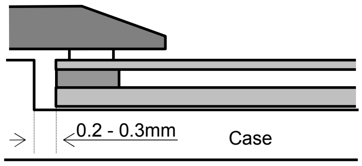
§ Cushion

If a cushion is used between the bezel and the top electrode, the cushion must be free enough to absorb the expansion and contraction difference between the bezel and the top electrode. If the cushion is squashed too hard, the expansion and the contraction difference may cause the distortion to the top electrode.
The cushion must be positioned more than 1mm outward from an inside of the insulation area. (Please refer to right figure)



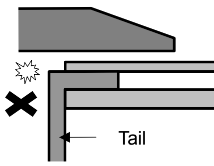
§ Tolerance

There is a tolerance of 0.2 to 0.3mm for the dimensions of the touchscreen and the tail. A gap must be made to absorb the tolerance in the case and the connector.



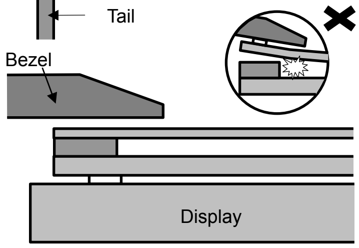
§ Tail

The tail must not be forcibly stressed or bent too hard to avoid the conduction in the insulated area and wire breaking.



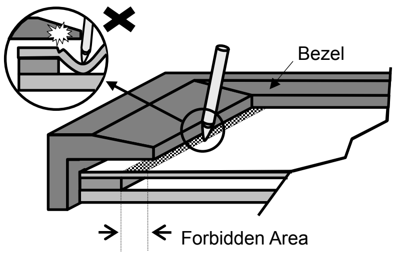
§ Mounting

Touchscreen must be held from the bottom such as the structure gluing the touchscreen onto the display. If the touchscreen is glued to the bezel, the adhesion between the top and bottom electrode is stressed and may come off.



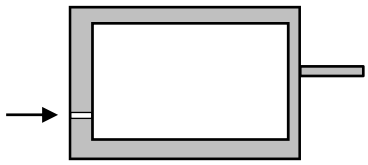
§ Forbidden Area

The area within 2mm from the insulation area is structurally week for the pressure, espcially for pen use. The film may be forcibly bent and may cause defection. This area must be protected by the bezel and input must be avoided.



§ Air Vent

Most of the touchscreens have the air vent to equalize the inside air pressure to the outside one. The air vent must be open and liquid contact must be avoided as the liquid may be absorbed if the lquid is accumilated near the air vent. The top electlode must not be swelled by the air pressure from inside of the case.



6. Warranty

6-1. Warranty Period

§ The warranty period is limited to 1 year from the date of shipping. The warranty for the initial defection such as appearance defection is limited to 1 month.

§ Any defected parts under proper use will be examined by the supplier and replaced by the new parts if the defection is considered to be caused by the supplier.

§ The replacement is subject to be included in the next lot.

6-2. Warranty Target

§ The warranty only covers the product itself and does not cover any damage to others caused by using this product. Onsite repair or replacement is not supported.

§ We will do our best for delivery problem and product defections, but the warranty for the production line is not covered.

§ Resistive touchscreens are structurally not repairable. All defections are subject to replacement.

6-3. Warranty Exceptions

Following conditions are not covered with the warranty and subject to charge.

§ Any malfunctions and damages during transportation and transfer by the user.

§ Any malfunctions and damages caused by a natural disaster or a fire.

§ Any malfunctions and damages caused by static electricity

§ Any malfunctions and damages caused by the failure of the associated equipment.

§ If the product is remodeled, disassembled or repaired by the user.

§ If the product is glued onto the equipment and uninstalled.

§ Any malfunctions and damages caused by an improper usage and handling against the specifications and notes.

6-4. Tools

§ To maintain the quality, the printing screens and the die-cut plates are generally limited to use up to 1 year. Reorders after 1 year from the initial order or from the last renewal are subject to the tooling charge for replacing the printing screens and the die-cut plates. Reorders for the discontinued standard parts are also subject to tooling charge.

§ All the tools, such as CAD data (except for the drawing for approval), block copies (films), printing screens, and die-cut plates are not to be provided for administrative purpose.

6-5. Changes

§ Because of the manufacturing process, changing the dimensions, circuit pattern, and the tail position requires replacing most of the tools and is subject to high tooling charge. Please be careful when ordering and approving the drawing.

§ Circuit pattern and the materials that does not affect the environmental, electrical, and mechanical characteristics such as film, glass, ink and glue are subject to change for the supplier's reason or for improvement within the specifications.

§ Standard products are subject to change for improvement without notice.

7. Revision history

Rev1 (April 15, 1998)
Initial release

Rev2 (June 1, 1999)
The overall revision by specification review.

Rev3 (April 1, 2002)
The address in the office was changed by the move.

Rev4 (August 16, 2002)
1-4.Activation Force is changed “50g± 30g” to “0.5N±0.3”.
1-4.Light Transmission is changed 76% to 80%(TYP).

Rev5 (September 3, 2002)
1-3.Operating Temperature is changed “0°C to 60°C” to “-20°C to 70°C”.
1-3.Storing Temperature is changed “-20°C to 70°C” to “-40°C to 80°C”
1-4.Operating Life is changed “1,000,000 hits” to “10,000,000 hits”.
1-5.Linearity is changed “Under ±2%” to “Under ±1% (typical value)”.

Rev6 (June 28, 2004)
1-3.Operating Humidity is changed “Less than 90%RH (no condensation)” to “-20°C to 60°C Less than 90%RH (no condensation) Exceeding 60°C 133.8g/m^3 (no condensation)”.
1-3.Storing Humidity is changed “Less than 95%RH (no condensation)” to “-40°C to 60°C Less than 95%RH (no condensation), Exceeding 60°C 142.9g/m^3 (no condensation)”.
1-5.Maximum Voltage is changed “DC5V” to “DC6V”.
1-5.Linearity is changed “Under ±1% (typical value)” to “Under ±2% (Under ±1% (typical value))”.

Rev7 (October 15, 2004)
4-4.Electrical & Software Notice: Changed “FIT-10 series” to “TSC-10 series”.

Rev8 (April 7, 2005)
Added Item4 Recommended Connector.

Rev9 (September 6, 2005)
2-3.Mechanical Characteristics: Added Operating Life Test (Pen).

Rev10 (November 10, 2006)

The specification item name was changed.

1-3."Storing Temperature" to "Storage Temperature"

1-3."Storing Humidity" to "Storage Humidity"

1-4."Operating Load" to "Activation Force"

1-4."Light Transmissivity" to "Light Transmittance"

1-4."Top Surface Hardness" to "Surface Hardness"

2-3."Operating Load Test" to "Activation Force Test"

2-3."Operating Load" to "Activation Force"

3-1."Operationg Load" to "Activation Force"

1-4.Operating Force is changed "0.5N±0.3N" to "0.05N to 0.8N".

1-5.Insulation Resistance is changed "Over 100MΩ at 25V" to "Over 20MΩ at 25V".

1-6.Tip, crack: Deleted "Applied only in the Active Area. Scratches or dusts in the outside of the Active Area are acceptable unless the electrical characteristics are affected.".

2-3. § Operating Life Test (Pen) Load: 300g to 250g

5-5. § Cushion: Added an installation position of a cushion.

7.Added Revision History.

Rev11 (March 23, 2010)

1-6. Appearance specification was revised. Characters of scratch/dust were classified into Circular and Linear. The total acceptable number of scratch/dust was added.

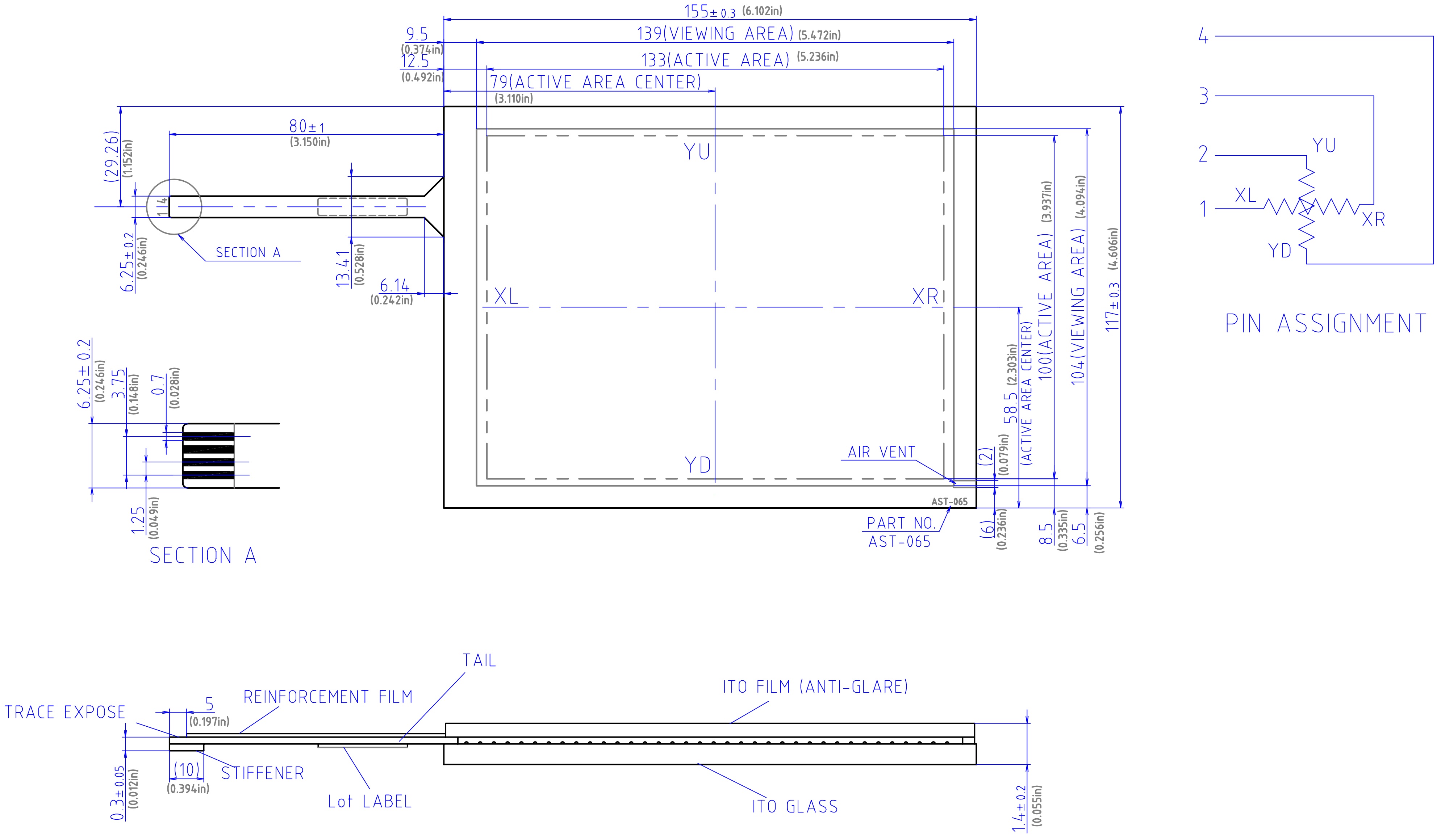
2-3. Unit of Load (g) changed to (N) to unify the unit

2-3. Operating Life Test (Finger) Activation Force, Within ±50% of the specification → Must satisfy the specification. (Clerical error was corrected)

2-3. Operating Life Test (Pen) Activation Force, Within ±50% of the specification → Must satisfy the specification. (Clerical error was corrected)

3-1. Temperature Condition Cold Test -30℃→ -40℃ (Clerical error was corrected)

3-1. Activation Force, Within ±50% of the specification. → Must satisfy the specification (Clerical error was corrected)



Tolerance± 0.5
Unit=mm

DATA MODUL

PART	DATE
AST-065	2003.03.15
TYPE	
STANDARD TOUCHSCREEN DIMENSIONAL DRAWING	DMC Co., Ltd.

DATA MODUL
DISPLAYS AND EMBEDDED SOLUTIONS



DATA MODUL Headquarters Munich
Landsberger Str. 322
D-80687 Munich - Germany
Phone: +49-89-56017-0
Fax: +49-89-56017-119
www.data-modul.com

Sales Office Hamburg
Borsteler Chaussee 51
D-22453 Hamburg - Germany
Phone: +49-40-42947377-0

Sales Office Duesseldorf
Fritz-Vomfelde-Str. 8
D-40547 Duesseldorf - Germany
Phone: +49-211-52709-0

Sales Office Scandinavia
Lundsmindevej 5
DK-6000 Kolding - Denmark
Phone: +45-75-224477

DATA MODUL France, S.A.R.L.
Bat B – Hall 204
1-3 Rue des Campanules
F-77185 Lognes - France
Phone: +33-1-60378100

DATA MODUL Italy, S.r.l.
Regus Center Senigallia
Via Senigallia 18/2
I-20161 Milano - Italy
Phone: +39-02-64672509

DATA MODUL Iberia, S.L.
c/ Adolfo Pérez Esquivel 3
Edificio Las Americas III Oficina 40
28230 Parque Empresarial
Las Rozas / Madrid - Spain
Phone: +34-916-366458

DATA MODUL Suisse GmbH
Stationsstr. 57
CH-8606 Nänikon - Switzerland
Phone: +41-44-94091-50

DATA MODUL Ltd. / UK
Collins Building
3 Vigo Place - Aldridge - Walsall
WS9 8UG - United Kingdom
Phone: +44-121-6988641

DATA MODUL Inc. / USA
275 Marcus Blvd, Unit K
Hauppauge, NY 11788 - USA
Phone: +1-631-951-0800